

Matthew W. Sunseri Vice President Operations and Plant Manager

October 17, 2009

WO 09-0034

U. S. Nuclear Regulatory Commission ATTN: Document Control Desk Washington, DC 20555

Subject:

Docket No. 50-482: LER 2009-002-00, Loss of Offsite Power due

to Lightning

Gentlemen,

The enclosed Licensee Event Report (LER) 2009-002-00 is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(iii), 10 CFR 50.73(a)(2)(iv), 10 CFR 50.73(a)(2)(v), and 10 CFR 50.73(a)(2)(vii). This is in regard to a Loss of Offsite Power event that resulted in a reactor trip at Wolf Creek Generating Station.

Commitments made by Wolf Creek Nuclear Operating Corporation in the enclosed LER are identified in the Attachment to this letter.

If you have any questions concerning this matter, please contact me at (620) 364-4008, or Mr. Richard D. Flannigan, Manager Regulatory Affairs at (620) 364-4117.

Sincerely,

Matthew W. Sunseri

MWS/rlt

Attachment Enclosure

cc: E. E. Collins (NRC), wa, we

V. G. Gaddy (NRC), wa, we

B. K. Singal (NRC), wa, we

Senior Resident Inspector (NRC), wa, we

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LIST OF COMMITMENTS

The following table identifies those actions committed to by Wolf Creek Nuclear Operating Corporation in this document. Any other statements in this letter are provided for information purposes and are not considered regulatory commitments. Please direct questions regarding these commitments to Mr. Richard Flannigan, Manager Regulatory Affairs at Wolf Creek Generating Station, (620) 364-4117.

REGULATORY COMMITMENT	DUE DATE
WCNOC and the owner companies will establish an upper tier WCNOC/Owners policy and agreement in accordance with FERC and applicable industry guidance to outline necessary program responsibilities and commitments between WCNOC and the Owners and establish lower tier implementation guidance documents covering, at a minimum, design, operation, and maintenance (including inspections and performance monitoring) for all equipment in the WCGS Switchyard up to and including the remote substation interfaces.	04/01/2010
The owners of WCGS, utilizing industry guidance, shall update the RCM process to utilize the desired preventive and predictive maintenance activities, frequencies, spare parts, critical substation components and performance monitoring for WCGS Switchyard and the WCGS terminals at La Cygne, Rose Hill and Benton substations and interfacing transmission components.	12/31/2010
The entry into T/S 3.0.3 resulting from performing procedure EMG ES-02, "Reactor Trip Response," will be prevented by clarifying this, and other procedures that contain a similar step, to indicate that only one of these valves may be manually operated at a time to restore instrument air.	03/31/2010

NRC FOF	DRM 366 U.S. NUCLEAR REGULATORY COMMISSION					SION	APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010											
(9-2007) LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)								Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by interesemail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.										
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08	19	2009	2009 - 002 - 00			10	17	2009	FACIL	LITY NAME						DOCKET NUMBER 05000		
O. OPERATING MODE 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)																		
1 10. POWER LEVEL 100			□ 20.2201(b) □ 20.2203(a)(3)(i) □ 20.2203(a)(1) □ 20.2203(a)(4) □ 20.2203(a)(2)(i) □ 50.36(c)(1)(i)(A) □ 20.2203(a)(2)(ii) □ 50.36(c)(1)(ii)(A) □ 20.2203(a)(2)(iii) □ 50.36(c)(2) □ 20.2203(a)(2)(iv) □ 50.46(a)(3)(ii) □ 20.2203(a)(2)(v) □ 50.73(a)(2)(i)(A) □ 20.2203(a)(2)(vi) □ 50.73(a)(2)(i)(B)				(3)(ii) (4) (i)(A) (ii)(A) (ii)(A)		□ 50.73(a)(2)(i)(C) □ 50.73(a)(2)(vii) □ 50.73(a)(2)(ii)(A) □ 50.73(a)(2)(viii)(A) □ 50.73(a)(2)(ii)(B) □ 50.73(a)(2)(viii)(B) □ 50.73(a)(2)(iii) □ 50.73(a)(2)(ix)(A) □ 50.73(a)(2)(iv)(A) □ 50.73(a)(2)(x) □ 50.73(a)(2)(v)(B) □ 73.71(a)(4) □ 50.73(a)(2)(v)(C) □ OTHER □ 50.73(a)(2)(v)(D) □ Specify in Abstract below or in NRC Form 366A					(B) A) et below				
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14. SUPPLEMENTAL REPORT EXPECTED ☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)					⊠	NO		SUBI	(PECTE WISSION DATE		MONT	Ή	DAY	YEAR				
ABSTRA	CT (Lin	nit to 1400	spaces,	i.e., ar	proxim	ately 1	5 single-si	paced type	ewritten l	ines)			-					
On 0 appre	On 08/19/2009 Wolf Creek Generating Station (WCGS) was operating at approximately 100% power. At approximately 1549 hours, WCGS experienced an unplanned automatic shutdown. The turbine and reactor trip occurred due to the momentary loss of offsite power (LOOP) to the onsite buses. Operations personnel and safety equipment responded appropriately to place the plant in a stable condition in Mode																	

3.

All control rods inserted fully and the Reactor Protection System and the Engineered Safety Features System performed as expected.

A lightning strike on LaCygne 345 kV line caused the loss of the LaCygne line. The Rose Hill 345 kV line was lost due to a loss of carrier function, causing line operation (opening of switchyard breakers), and subsequent loss of the Benton 345 kV line as a result of the unit heading toward instability.

The safety significance of this event is low. Both emergency diesel generators started and supplied power to the safety related buses. There were no adverse effects on the health and safety of the public. (9-2007)

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6	6. LER NUMBER	3. PAGE			
WOLF CREEK GENERATING STATION	05000 482	YEAR	SEQUENTIAL NUMBER	REV NO.	,	OF	9
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BACKGROUND:

The Kansas Gas and Electric and Kansas City Power and Light transmission network serves as the main outlet and source of offsite power for Wolf Creek Generating Station (WCGS). Connection of the station output to the transmission network is achieved via a 345-kV overhead line from the plant yard to the WCGS 345-kV switchyard [EllS Code: FK]. There are three 345-kV lines connecting the WCGS 345-kV switchyard to the area transmission network. The three lines are as follows:

a. WCGS-LaCygne 345-kV Line:

58 miles long, connecting to the LaCygne Steam Electric Station which has three additional 345-kV lines.

b. WCGS-Rose Hill 345-kV Line:

98 miles long, connecting to the Rose Hill Substation southeast of Wichita. Rose Hill Substation has two additional 345-kV connections.

c. WCGS-Benton 345-kV Line:

90 miles long, connecting to the Benton Substation northeast of Wichita. Benton Substation has two additional 345-kV lines, one of which is to the Wichita 345-kV Substation, near the Gordon Evans Steam Electric Station.

If one of the three 345-kV lines faulted, the breakers located at WCGS switchyard would trip, deenergizing the line. Any one of the two remaining incoming 345-kV transmission lines at WCGS switchyard can carry the total Engineered Safety Features (ESF) load required for safe shutdown by controlled switching of the WCGS switchyard breakers, providing a separate transmission line feeding each ESF transformer.

Offsite power is supplied to the WCGS switchyard from the tranmission network. From the switchyard, two electrically and physically separate offsite circuits provide AC power through the ESF transformers, to the 4.16 kV ESF buses. See Figure 1 below. One offsite circuit feeds through ESF transformer XNB01 and supplies power normally to its associated 4.16-kV Class 1E bus [EIIS Code: EK]. The other offsite circuit feeds through the startup transformer (S/U), through ESF transformer XNB02, and supplies power normally to its associated 4.16-kV Class IE bus. In addition, each offsite circuit can be manually aligned to supply power to the opposite or both 4.16-kV Class IE busses, if required. Each of these offsite circuits is designed to be available in sufficient time to ensure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded following a loss of all onsite power sources and the remaining offsite circuit.

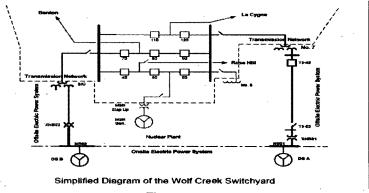


Figure 1

NRC FORM 366A

U.S. NUCLEAR REGULATORY COMMISSION

(9-2007)

LICENSEE EVENT REPORT (LER)

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PLANT CONDITIONS PRIOR TO EVENT:

Mode -- 1
Power Level - 100%
Normal Operating Temperature and Pressure

EVENT DESCRIPTION:

During a thunderstorm on 8/19/09 at 15:49:13.275 the WCGS-LaCygne 345kV transmission network line breakers 345-110 and 345-120 at the (WCGS) switchyard opened in response to an "A" phase ground fault approximately 3.6 miles from the switchyard. The relays for the WCGS line, located at the La Cygne substation, also indicated a ground fault on the same phase in approximately the same location. The phase to ground fault was most likely caused by a lightning strike, since several lightning strikes were detected in the vicinity of the transmission line at the time and the fault was not a permanent fault.

At 15:49:13.287 the WCGS-Rose Hill 345 kV transmission network line breakers 345-50 and 345-60 at the Rose Hill Substation opened in response to a GE MOD-3 pilot distance relay actuation on the ground impedance element. The pilot distance relay monitors for line faults and is designed to overreach into the LaCygne line. The relay tripped on high speed in response to the LaCygne line fault when the carrier signal system failed and allowed the relay to overreach and operate.

At 15:49:13.863 the WCGS-Benton 345 kV transmission network line breaker 345-110 opened and at 15:49:13.870 breaker 345-120 opened at the Benton Substation. The Benton line Primary-1 relay operated due to the system apparent impedance reaching the relay tripping setpoint as a result of the unit heading towards instability.

At 15:49:13.854 the "Power/Load Unbalance" circuit at WCGS actuated which energized the turbine control valve fast closing circuits. As a result of the LOOP, the turbine and the reactor tripped. All control rods inserted into the core. All reactor coolant pumps tripped on under frequency. Both emergency diesel generators (EDGs) started and supplied power to the safety related busses.

At 15:50:08.505 the WCGS-Rose Hill 345 kV transmission network line breaker 345-50 at the Rose Hill Substation was closed returning offsite power to the switchyard.

At 16:01:17.000, the WCGS-Benton 345 kV transmission network line breaker 345-120 at the Benton Substation was closed restoring a second transmission line in support of offsite power.

At 16:02:20 the WCGS-LaCygne 345 kV transmission network line breaker R9-10 at the LaCygne switchyard was closed restoring the third transmission line in support of offsite power.

The restoration of the offsite transmission lines restored power to the WCGS switchyard and to the XNB01 and XNB02. Power to the safety related buses continued to be supplied by the EDGs.

NRC FORM 366A

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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WOLF GREEK GENETIATING STATION	100000 402	2009	002	00	_	<u> </u>	Ů

During the Plant Trip response, Limiting Conditions for Operation (LCO) 3.0.3 was entered in response to performing procedure EMG ES-02, "Reactor Trip Response," step 5 Response Not Obtained (RNO). This step locally opens essential service water (ESW) valves to provide ESW cooling flow to the "A" and "B" air compressors for instrument air. Locally opening these valves prevents them from isolating on a high flow condition. Operations declared both trains of ESW inoperable and entered LCO 3.0.3 at 16:14. LCO 3.0.3 was exited at 18:09 when the valves were returned to their normal position. Note: The one hour requirement, in TS 3.0.3, was not implemented to initiate action to place the unit in Mode 4 within 13 hours or restore ESW operability to one train.

BASIS FOR REPORTABILITY:

This Licensee Event Report is being submitted in accordance with:

- 10 CFR 50.73(a)(2)(i)(B), an operation or condition prohibited by Technical Specifications (entry into LCO 3.0.3 for greater than one hour),
- 10 CFR 50.73(a)(2)(iii), any natural phenomenon or other external condition that posed an actual threat to the safety of the nuclear power plant.
- 10 CFR 50.73(a)(2)(iv)(A) requires reporting of "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section." Paragraph (B)(1) of 10 CFR 50.73(a)(2)(iv) includes "Reactor protection system (RPS) including: reactor scram or reactor trip. Paragraph (B)(8) of 10 CFR 50.73(a)(2)(iv) includes "Emergency ac electrical power systems, including: emergency diesel generators (EDGs)."
- 10 CFR 50.73(a)(2)(v)(D), any event or condition that could have prevented the fulfillment of the safety function of strutures or systems, (loss of both offsite electrical sources and both trains of ESW inoperable due to entry into LCO 3.0.3 for greater than one hour).
- 10 CFR 50.73(a)(2)(vii), any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single system.

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CAUSE:

The cause of the turbine and reactor trip was a LOOP. Lightning strike on LaCygne line caused the loss of the LaCygne line and loss of the carrier function on Rose Hill line, causing line operation (opening of switchyard breakers) and subsequent loss of the Benton line due to a 3-phase impedance swing resulting in loss of offsite power.

The event was evaluated by an Incident Investigation Team (IIT) composed of subject matter experts from Wolf Creek Nuclear Operating Corporation, owner companies, and industry peers. The IIT reported that the root cause of the network's failure to respond to this lightning strike properly was that "WCNOC and the owners have not sufficiently ensured a mutually desired level of reliable service for substation and transmission interfacing equipment with Wolf Creek."

Entry into LCO 3.0.3 for greater than one hour was caused by inadequate procedure guidance that did not provide sufficient information to preclude this action. A Personnel error in implementation of the 1 hour requirement in TS 3.0.3 also occurred.

CORRECTIVE ACTIONS:

Prior to entering Mode ,1 WCNOC took the following interim actions to ensure reliability until corrective actions to prevent recurrence could be implemented:

- Walkdown of the Rose Hill Substation and WCGS switchyard for evidence of damaged Structures, Systems, or Components (SSCs).
- Replaced all three Rose Hill Coupling Capacitor Voltage Transformers (CCVTs).
- Completed a post-maintenance test of the Rose Hill line.
- Performed WCGS to LaCygne line carrier checks to check the as-found levels of transmit and receive.
- Performed WCGS to Benton line carrier checks to check the as-found levels of transmit and receive.

In addition WCNOC and the owners have put the following compensatory actions in place until corrective actions to prevent recurrence are completed:

- The frequency of carrier line circuit checks has been increased from every 24 hours to every 12 hours for Rose Hill and to every 8 hours for Benton and LaCygne. This will remain in effect through Refueling Outage 17, when all carrier check frequencies will be every 8 hours. The 8-hour frequency will remain in effect indefinitely unless an approved alternative design is implemented.
- If a WCGS switchyard transmission line was to experience a line operation due to a fault (lightning, wind, structure failure, etc.) and the line were to automatically reclose (after any reclose), then the WCGS control room staff shall request the Westar Transmission System Operator to perform a manual carrier check to ensure the line is acceptable for service.

As corrective actions to prevent recurrence, WCNOC and the owner companies will establish an upper tier WCNOC/Owners policy and agreement in accordance with FERC and applicable industry guidance to outline necessary program responsibilities and commitments between the WCNOC and the Owners and establish lower tier implementation guidance documents covering, at a minimum, design, operation, and maintenance (including inspections and performance monitoring) for all equipment in the WCGS switchyard, up to and including the remote substation interfaces. Actions scheduled to be complete 04/01/2010.

NRC FORM 366A

U.S. NUCLEAR REGULATORY COMMISSION

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WOLF CREEK GENERATING STATION	05000 482	YEAR	SEQUENTIAL NUMBER	REV NO.	6	OF	6
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A contributing cause of the conditions leading to this event was found to be that a Reliability Centered Maintenance (RCM) program was in progress for WCGS, but not fully implemented for the WCGS substation. An RCM program for the remote substation terminals and transmission preventive maintenance, inspection and testing has not been effectively developed or implemented to the point equipment reliability meets expectations.

The owners of WCGS, utilizing industry guidance, shall update the RCM process to utilize the desired preventive and predictive maintenance activities, frequencies, spare parts, critical substation components and performance monitoring for WCGS switchyard and the WCGS terminals at LaCygne, Rose Hill and Benton Substations and interfacing transmission components. Actions scheduled to be complete 12/31/2010.

The entry into LCO 3.0.3 resulting from performing procedure EMG ES-02, "Reactor Trip Response," will be prevented by clarifying this, and other procedures that contain a similar step, to indicate that only one of these valves may be manually operated at a time to restore instrument air. Actions scheduled to be complete 03/31/2010.

SAFETY SIGNIFICANCE:

The safety significance of this event is low. All equipment relied upon for safe shutdown responded as designed. The "A" and "B" EDGs started and supplied power to the safety related buses. Nuclear safety was maintained by implementation of station procedures after the automatic shutdown of the reactor. There were no adverse effects on the health and safety of the public.

PREVIOUS OCCURRENCES:

LER 2008-004-00 described a LOOP event when the reactor was defueled. The cause was personnel error when a technician closed the wrong set of test switches on a switchyard breaker control panel during preventive maintenance activities.

LER 2004-005-00 described a reactor trip due to a lightning strike in the switchyard. The lightning induced electromagnetic interference which caused a false high-high vibration signal from the main turbine vibration monitoring system and tripped the turbine.